

Application No 10/042,935
Amendment dated June 23, 2005
Reply to Office Action mailed February 23, 2005

REMARKS

The present Amendment is in response to the Examiner's Office Action mailed February 23, 2005. Claims 1 and 8 are cancelled and claim 15 is amended. Claims 2-7 and 9-19 are now pending in view of the above amendments.

Please note that the following remarks are not intended to be an exhaustive enumeration of the distinctions between any cited references and the claimed invention. Rather, the distinctions identified and discussed below are presented solely by way of example to illustrate some of the differences between the claimed invention and the cited references. In addition, Applicants request that the Examiner carefully review any references discussed below to ensure that Applicants understanding and discussion of the references, if any, is consistent with the Examiner's understanding. Reconsideration of the application is respectfully requested in view of the above amendments to the claims and the following remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in the order in which the corresponding issues were raised in the Office Action.

Claim Objections

Claim 15 was objected to for an informality. Claim 15 has been amended to include the insertion of "a" before "diameter" as suggested by the Examiner to overcome the objection.

Rejection of Claims 2-4, 9-11, and 14-19 Under 35 U.S.C. § 103

The Office Action rejects claims 2-4, 9-11 and 14-19 under 35 U.S.C. § 103(a) as being unpatentable over *Kato*. ("Optical Coupling Characteristics of Laser Diodes to Thermally Diffused Expanded Core Fiber Coupling Using an Aspheric Lens") in view of *Papademetriou* (U.S. Patent Publication No. 2001/0020164) and *Kawasaki* (U.S. Patent No 5,594,825).

The Office Action admits that *Kato* does not disclose the light spot diameter to be no larger than the diameter at the first end of the TEC optical fiber. The Office Action relies on *Papademetriou* to disclose the benefits of coupling a light spot having a diameter less than that of the fiber core. The Office Action then indicates that one of ordinary skill in the art would have recognized that the teaching of *Papademetriou* would be applicable to any fiber, including TEC fibers. The following discussion illustrates, however, that neither *Kato* or *Papademetriou*

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teach or suggest "a light spot created by the focused light . . . that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber, but no larger than the diameter of the first end of the TEC optical fiber" as required by claims 14 and 15.

As indicated by the title of *Kato*, *Kato* addresses the optical coupling characteristics of laser diodes to thermally diffused expanded core (TEC) fibers. More particularly, *Kato* notes that during assembly of LD modules, "single-mode fibers have severe misalignment tolerance of the fiber during the assembly process" and that "the misalignment tolerance is very severe when a higher Δn single-mode fiber . . . is applied to the LD module". See *Kato* page 469. The solution to the misalignment tolerance of the fiber during the assembly process is to use a TEC fiber. See *Id.* *Kato* concludes that the "TEC fiber . . . expanded the misalignment tolerance to 4.4 times that of a nonexpanded core fiber". See *Kato* page 470.

Kato therefore teaches expanding the misalignment tolerance to simplify assembly of an LD module, but *Kato* is silent regarding the size of the light spot required by claims 14 and 15. In fact, increasing the spot size in *Kato* may have the adverse effect of eliminating the advantages of increased misalignment tolerances because an increased spot size would reduce the misalignment tolerance for the increased spot size. In other words, the misalignment tolerance is greater for a small spot size on an area of a TEC fiber than the misalignment tolerance for an increased spot size the same size area. *Kato* therefore teaches away from increasing the spot size at the cost of reducing the misalignment tolerance.

The Office Action attempts to remedy the deficiency of *Kato* by citing *Papademetriou*. In particular, the Office Action cites ¶[0040] to suggest that one of skill in the art would have applied the teachings of *Papademetriou* to a TEC fiber. Applicants do not agree.

The TEC fibers of claims 14 and 15 have two different core diameters. In claims 14 and 15, the diameter of the unexpanded portion is less than the diameter of the expanded portion of the TEC fiber. The spot size is greater than the diameter of the unexpanded portion and no larger than the diameter of the expanded portion of the TEC fiber. It is difficult to apply the teachings of *Papademetriou* to a TEC fiber because the fiber in *Papademetriou* only has one core diameter. In other words, there is no suggestion or teaching in *Papademetriou* regarding what the spot size should be to minimize energy losses when a fiber has two different core diameters.

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However, *Papademetriou* does teach that to minimize energy losses, the spot size of the radiation energy delivered to each fiber is less than the fiber's core diameter. See ¶[0040]. This suggests that increasing the spot size will result in energy losses. Because the core for most of a TEC fiber is unexpanded, one of skill in the art would assume that the spot size should remain smaller than the diameter of the unexpanded portion of the TEC fiber in order to minimize energy losses.

More specifically, the Office Action indicates that one of ordinary skill in the art would have been motivated to keep the light spot diameter less than the core diameter at the expanded end of the TEC fiber. However, this requires increasing the spot size such that it is larger than the core diameter of the unexpanded portion of the TEC fiber and as previously stated, increasing the spot size likely increases the energy losses. Therefore, having a spot size that is larger than the unexpanded portion of the TEC fiber does not accord with *Papademetriou*, which teaches that the spot size is ideally less than the fiber's core diameter. See ¶[0040]. In other words, *Papademetriou* fails to teach or suggest the spot size of light in a TEC fiber and does not teach or suggest the spot size of light on a fiber that has more than one core diameter.

In sum, *Kato* is directed to simplifying the assembly of LD modules by increasing a misalignment tolerance. *Kato* further suggests that increasing the spot size could reduce the misalignment tolerance that was gained by the use of a TEC fiber. *Kato* teaches that the misalignment tolerance is beneficial for the assembly of an LD module, but increasing the spot size may decrease the misalignment tolerance. At the same time, *Papademetriou* suggests that increasing the spot size can increase energy loss. Further, increasing the spot size past the diameter of the unexpanded portion conflicts with the teaching in *Papademetriou* that the spot size is ideally less than the fiber's core diameter and, as discussed above, the diameter of the unexpanded portion of the TEC fiber is one of the fiber's core diameter.

In view of these teachings, claims 14 and 15 as presented herein are believed to overcome the art of record. Claims 2-4, 9-11, and 16-19 depend from one of claim 14 or 15 and also overcome the art of record for at least this reason.

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Rejection of Claims 5-7 and 12-15 Under 35 U.S.C. § 103

The Office Action rejects claims 5-7 and 12-15 under 35 U.S.C. § 103(a) as being unpatentable over *Cheng* (U.S. Patent No: 5,825,950) in view of *Papademetriou et al* and *Kawasaki et al*.

The Office Action admits that *Cheng* does not disclose the light spot diameter to be no larger than the diameter at the first end of the TEC optical fiber. For reasons discussed above, *Papademetriou* suggests that increasing the spot size can increase energy loss and that the spot size is ideally less than the fiber's core diameter. *Papademetriou* fails to address a fiber that has two different diameters however. Because increasing the spot size can increase energy loss and because *Papademetriou* teaches that the spot size is ideally less than the diameter of the fiber's core, there is no suggestion or teaching in *Papademetriou* that one of skill in the art would increase the size of the spot size past the diameter of the unexpanded portion of the TEC fiber. For at least these reasons and the reasons discussed above, claims 14 and 15 overcome this rejection as well. Claims 5-7 and 12-13 depend from one of claims 14 or 15 and overcome this rejection for at least this reason.

CONCLUSION

In view of the foregoing, Applicants believe the claims as amended are in allowable form. In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, or which may be overcome by an Examiner's Amendment, the Examiner is requested to contact the undersigned attorney.

Dated this 23rd day of June 2005.

Respectfully submitted,



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